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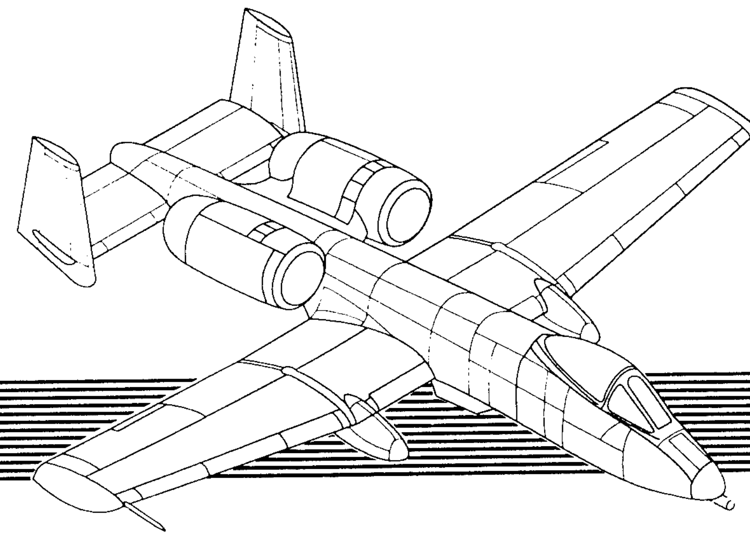

IMPROVED ALTIMETER SETTINGS FOR A-10 AIRCRAFT

by

Capt Timothy D. Oram
57 OSS/OSW
Nellis AFB NV 89191

FEBRUARY 1995

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AIR WEATHER SERVICE
102 West Losey Street
Scott Air Force Base, Illinois 62225-5206

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Director of Technology, Plans, and Programs

TIMOTHY D. ORAM, Capt, USAF
Author

FOR THE COMMANDER

CAROL L. WEAVER, PhD
Scientific and Technical Information
Program Manager
15 February 1995

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13. Abstract: This forecaster memo describes a process designed to improve the bombing accuracy of A-10 aircraft equipped with the Low Altitude Safety and Targeting Enhancement (LASTE) system by improving altimeter setting accuracy. After finding unacceptable altitude errors during tests of LASTE Version 3.3.The 57th Test Group (57 TG) at Nellis AFB asked the 57 OSS/OSW to develop a method for improving A-10 bombing accuracy by developing improved altimeter setting forecasts. The 57 TG also contracted for General Electric to include software in LASTE Version 4 to correct for these altitude errors automatically. This memo describes a method for improving altimeter setting forecasts in support of LASTE Version 3.3. It also explains basic altimetry theory and tells how the theory relates to the A-10 bombing problem. Finally, the memo provides weather forecasting tips for supporting the new LASTE Version 4.

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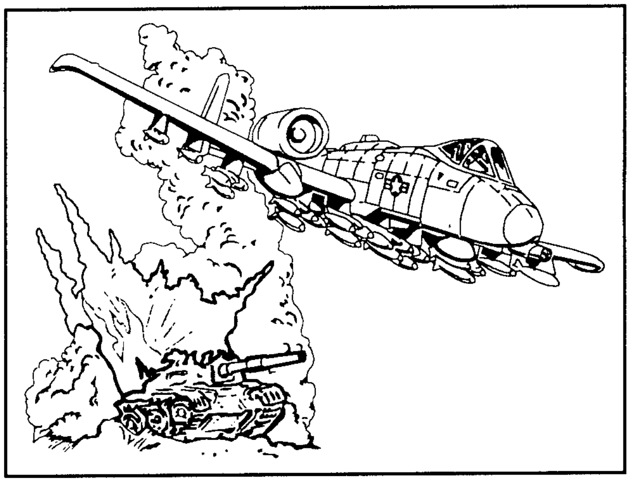
PREFACE

This forecaster memo describes a process designed to improve the bombing accuracy of A-10 aircraft equipped with the Low Altitude Safety and Targeting Enhancement (LASTE) systems by improving altimeter setting accuracy. The 57th Test Group (57 TG) at Nellis AFB asked the 57 OSS/OSW to develop a method for improving A-10 bombing accuracy through corrected altimeter settings after finding unacceptable altitude errors during tests of LASTE Version 3.3. The 57 TG also contracted with General Electric to develop software (LASTE Version 4) to correct for these altitude errors automatically. This memo discusses a method for improving altimeter settings for LASTE Version 3.3. It also explains basic altimetry theory and tells how the theory relates to the A-10 bombing problem. Finally, the memo provides weather forecasting tips for supporting the new LASTE Version 4.



For a pilot's perspective on altimeter settings and more detail on the LASTE 3.3 and 4.0, read "Reaching New Heights with LASTE" in the Summer 1993 *Weapons Review*.

The author owes thanks to several people. The basic idea for using altimeter settings to correct for the A-10 altitude errors was worked out in conversations with Mr. Al Caudel. MSgt Wayne Bradshaw provided valuable comments on the development of the manual method for forecasting LASTE 3.3 altimeter settings. The 57 OSS/OSW forecasters tested these methods and provided feedback to improve the process. Finally, Maj Dan Brees, Lt Col Frank Estis, Dr. Dale Meyer, and Lt Col James Davenport helped edit this memo to make it understandable.

INTRODUCTION

To put bombs on target, A-10 aircrews need accurate altitude measurements. During testing of the Low Altitude Safety and Targeting Enhancement (LASTE) 3.3 system, A-10 pilots found differences as large as 400 feet between barometric altimeter readings and those indicated by the radar altimeter. When A-10 pilots asked us for help, we developed a simple method for providing altimeter setting forecasts to be entered into the LASTE 3.3 system.

The 57th Test Group at Nellis also contracted with General Electric to develop an automated model for the next LASTE version (LASTE 4), with the improved altimeter settings built-in. The new version should work well under most environmental conditions, but with several limitations that are explained in this memo. The 57th Test Group is testing LASTE 4 now; operational A-10 units should transition to the new equipment in 1994 or 1995. In the meantime, forecasters can use the correction method described next to support A-10s using the LASTE 3.3 system.

This next section tells you how to compute LASTE 3.3 altimeter setting forecasts by using forecast heights of pressure surfaces. If your only interest is in getting the immediate job done, read no further. But if you'd like a refresher on altimetry and how it relates to dropping bombs from A-10s, read on. The last part of the memo describes certain weather limitations in the new LASTE 4 and offers tips to forecasters who will support it.

ALTIMETER SETTING FORECASTS FOR LASTE 3.3

Success in forecasting altimeter settings depends on forecasting the heights of constant pressure surfaces accurately. It is important to use *forecast* pressure surface heights (rather than observed values) to keep the accuracy within reasonable limits. If the model you are using does not include this information, you may want to consider factoring in the average diurnal variation of the height of the pressure levels by developing a table of diurnal variations for each month of the year You can then compute the forecast altimeter settings using the following procedure:

• Compute forecast sea-level pressure and heights of the 850, 700 and 500 millibar (mb) pressure levels for the target location and time over target.

• Plot the sea-level pressure, in inches of mercury, at zero feet above mean sea level (MSL) on a D-Value Computation Chart (AF Visual Aid 105-35).

• Plot the forecast heights, in meters, for the pressure levels on the chart. Connect the points to interpolate the values to MSL altitudes.

• Follow the constant D-Value line for each bombing altitude straight down to the bottom of the chart. The altimeter setting at the bottom of the chart is the correct altimeter setting for this altitude.

Figure 1 (Next page) is a plotted example.

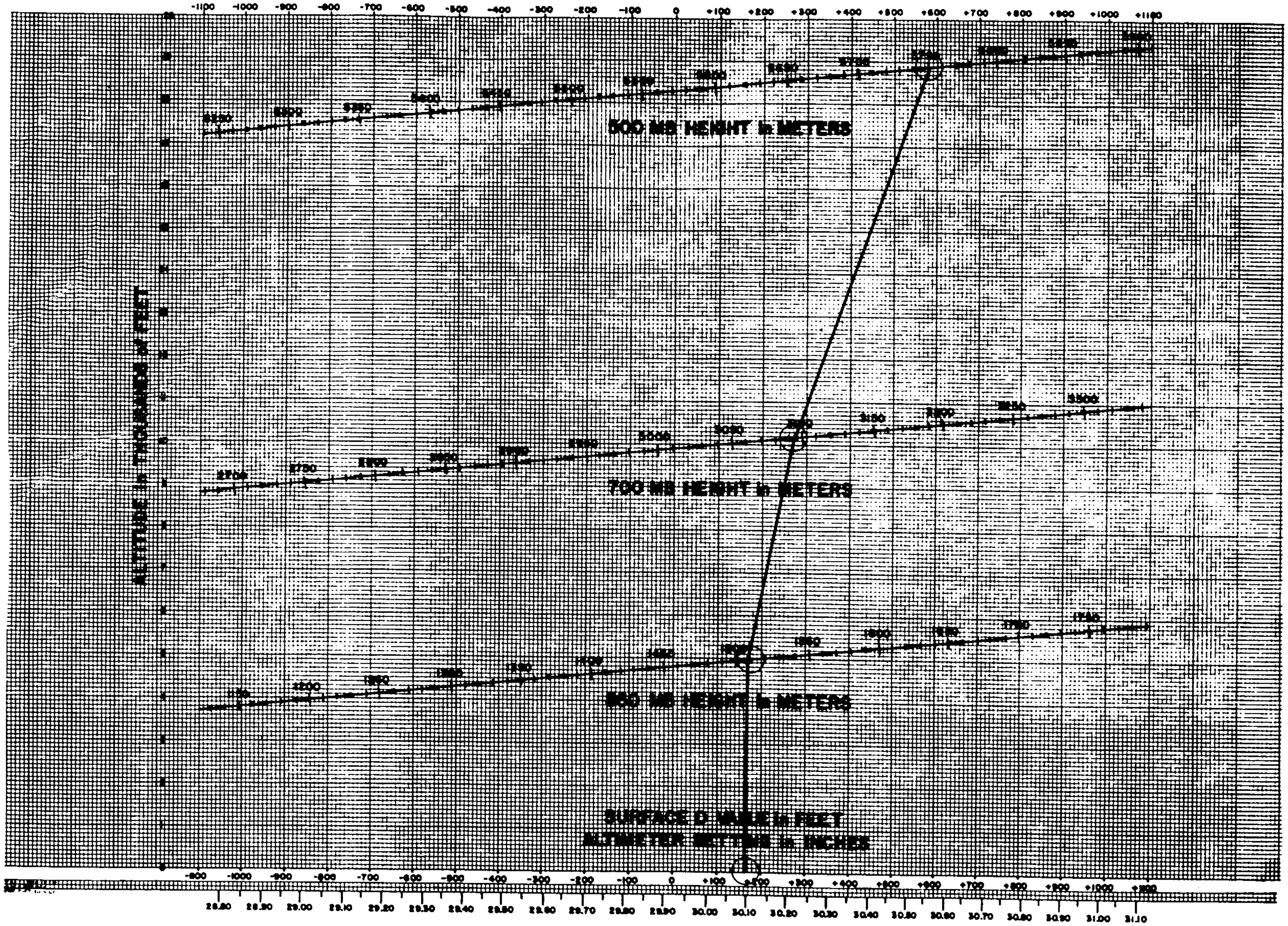


Figure 1. Plotted Example on D-Value Computation Chart (AFVA 105-35). Sea-level pressure is 30.10 inches. The heights of the pressure levels are 1,510, 3,090, and 5,750 meters for 850, 700 and 500 mb, respectively. In this example, the altimeter setting for 5,000 feet MSL is 30.11 inches; for 10,000 feet, 30.22 inches; and for 15,000 feet, 30.45 inches. The error would be over 300 feet in altitude if you used the altimeter setting for 5,000 feet at 15,000 feet.

The method described here is not new. Weather forecasters use it routinely to determine D-Values. We've just taken it a step farther to provide pilots with altimeter settings equivalent to the D-Value. Since pilots understand altimeter setting better than D-Value, they can better include the new method in the flight planning process. There can be a problem when the altimeter setting is higher than 31.00 inches since this is the maximum value in the aircraft altimeter's Kohlman window. We have not experienced this problem during testing at Nellis AFB, but it could occur at other locations.

We've also developed a computer program to calculate the improved altimeter setting. The inputs to the program include sea-level pressure and the forecast heights of the 1,000-mb and 925-mb levels, as well as those for 850 mb, 700 mb, and 500 mb. The results are the same for the computer or the manual method.

ALTIMETRY THEORY

What follows is a short refresher on altimetry. After that, we'll explain how theory relates to insuring accurate bomb release altitudes.

To understand how an aircraft altimeter works, we first need to understand how pressure changes with height in a constant lapse rate atmosphere. When working with the atmosphere, we assume that air is an ideal gas and that the pressure change with a change in altitude depends only on air density and gravity. The two equations describing these assumptions are the *ideal gas law* and the *hydrostatic equation.* Water vapor in the atmosphere causes problems when using the ideal gas law. In order to determine the correct air density of an air parcel with water vapor, we need to use *virtual temperature* rather than dry-air temperature; virtual temperature is the temperature a dry-air parcel would have if its density and pressure equaled the density and pressure of the parcel with water vapor. Virtual temperature is always higher than dry-air temperature because water vapor is less dense than dry air.

Using the ideal gas law and the hydrostatic equation, you can derive an equation relating the pressure to altitude under certain conditions (Hess, 1979, page 80). If we assume the lapse rate in the atmosphere to be constant, then this equation is:

$$p(z) = p(0) * \left(1 - \frac{\Gamma}{T_0} * z\right)^{\frac{g}{R * \Gamma}} \qquad \text{Equation 1}$$

$p(0)$ and T_o are the sea-level pressure and sea-level virtual temperature, $p(z)$ is the pressure at altitude z, and Γ is the virtual temperature lapse rate. The constants g and R are the gravitational acceleration (9.81 ms^{-2}) and the gas constant for dry air (287 Joules K^{-1} kg^{-1}).

The U. S. Standard Atmosphere assumes sea level pressure to be 1013.25 mb (29.92 inches), the surface temperature to be 15° C, the lapse rate to be 6.5° C per kilometer, and dry air (i.e., no water vapor). Using these constants and converting to measure altitude in feet, T/T_0 equals $6.875*10^{-6}$ ft^{-1} and $g/(R*\Gamma)$ equals 5.2561 in Equation 1.

Table 1 (next page) shows the U. S. Standard Atmosphere's relationship between altitude, pressure, and temperature calculated using Equation 1. An aircraft barometric altimeter simply converts a pressure measurement to an altitude, using

a barometer calibrated to match the U. S. Standard Atmosphere. By adjusting the aircraft altimeter's sea-level pressure, $p(0)$, the pilot corrects the pressure-altitude scale for deviations from the Standard Atmosphere.

Table 1. U.S. Standard Atmosphere Pressure and Temperature.

HEIGHT (FEET)	PRESSURE (MB)	TEMPERATURE (° CELSIUS)
0	1013.25	15
1000	977	13
2000	942	11
3000	908	9
4000	875	7
5000	843	5
6000	812	3
7000	781	1
8000	752	-1
9000	724	-3
10000	697	-5
15000	572	-15
20000	466	-25
25000	376	-34
30000	301	-44

As you can see from the preceding discussion the three causes of deviation from the standard atmosphere are non-standard sea-level pressures, non-standard temperatures and lapse rates, and water vapor in the atmosphere. Each of these conditions affects the aircraft altimeter differently. A non-standard sea level pressure "slides" the standard atmosphere pressure scale up or down, depending on whether the sea level pressure is higher or lower than standard, respectively. D-Values are *positive* when the pressure is *higher* than standard, and *negative* when the pressure is *lower* than standard. Figure 2 (opposite) shows this effect for sea level pressures of 29.38, 29.92, and 30.42 inches.

Non-standard temperatures "stretch" or "shrink" the standard atmosphere. If the atmosphere is *warmer* than standard, the pressure change with a change in altitude is *less* than in the Standard Atmosphere; *positive* D-Values increase with height. If the atmosphere is *colder* than standard, the pressure change with a change in altitude is *greater* than in the Standard Atmosphere; *negative* D-Values increase with height. A less than standard lapse rate (such as through an inversion) causes temperature to increase with height and has the same effect as warmer than standard temperatures. A greater than standard lapse rate has the same effect as temperatures that are colder than standard. Figure 3 shows the effects of cold and warm air masses.

Finally, humidity causes the atmosphere's density to decrease. This is equivalent to raising the temperature. Humidity, therefore, always acts to stretch the atmosphere. This effect explains why we use the virtual temperature to determine the thickness value between two pressure levels rather than just the dry bulb temperature.

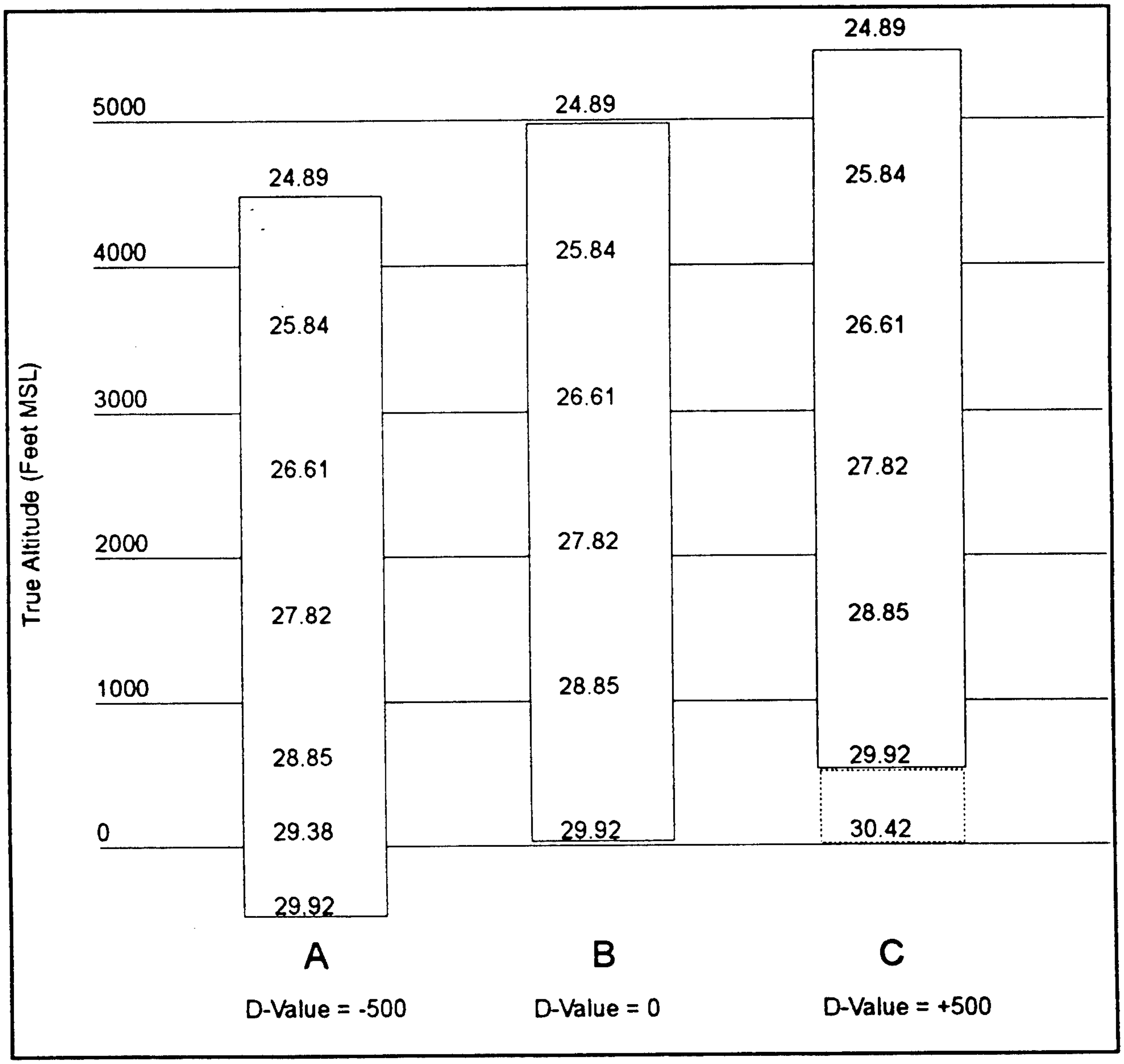


Figure 2. The Effects of Varying the Surface Pressure. All three atmospheres have standard lapse rates and the temperatures at 29.92 inches Hg are 15° C. Several common pressure levels are plotted at the appropriate height in each atmosphere.

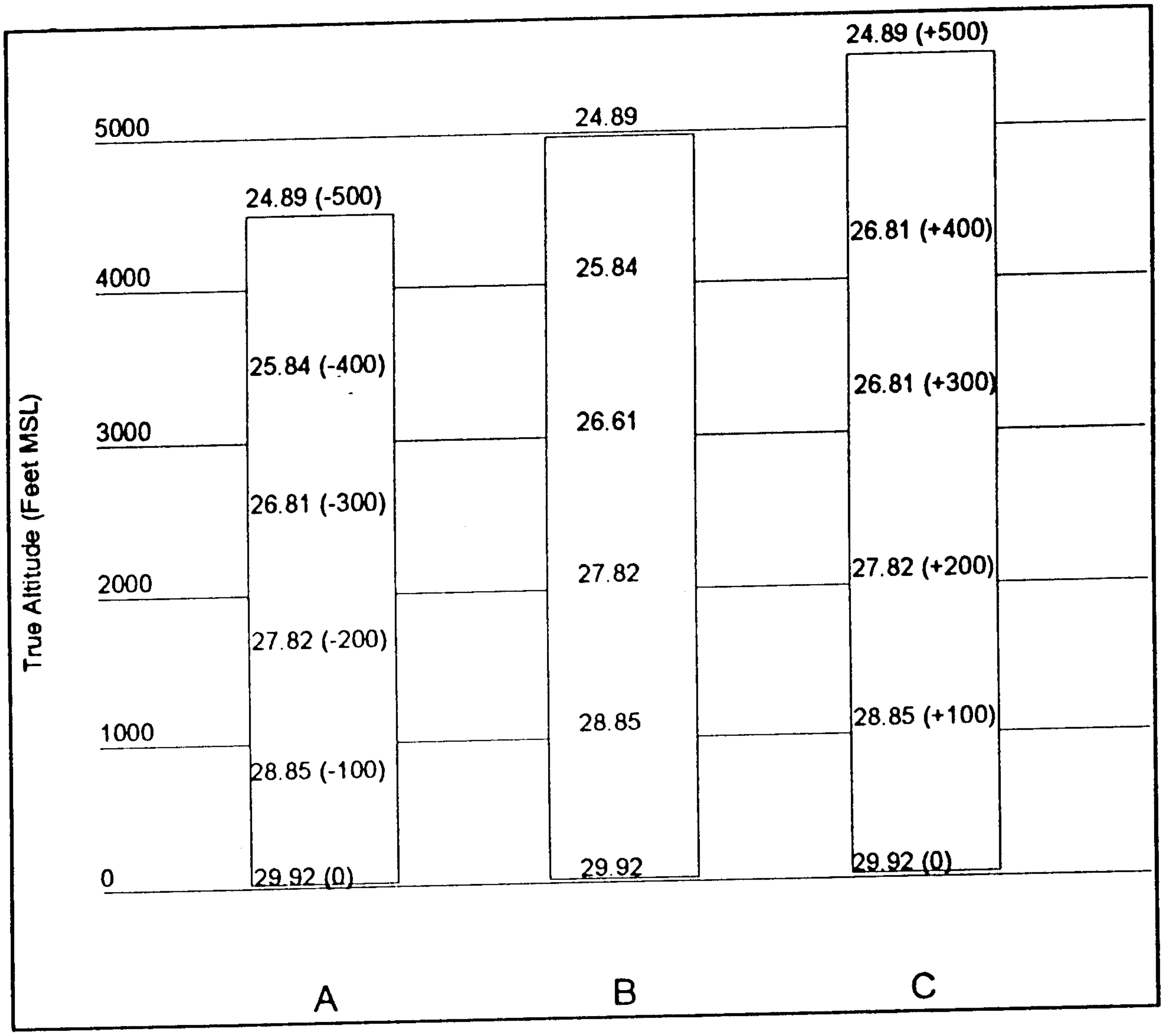


Figure 3. The Effects of Non-Standard Temperatures. All three atmospheres have the same sea level pressure. Atmosphere A is 10% *colder* than standard. Atmosphere B is the Standard Atmosphere. Atmosphere C is 10% *warmer* than standard. Several common pressure levels are plotted at the appropriate height in each atmosphere. The D-value associated with each pressure level is shown in the parenthesis next to the pressure value.

ALTIMETRY AND THE A-10 BOMBING PROBLEM

You may have wondered why, if LASTE uses a radar altimeter, A-10 pilots need improved altimeter setting forecasts. First, the radar altimeter only works below 5,000 feet AGL. Second, the radar altimeter needs fairly level terrain around the target to get an accurate reading. If it is safer to bomb from above the 5,000-foot range of the radar altimeter, or if the radar can't provide an accurate reading for whatever reason, the pilot will choose to bomb on the barometric altimeter.

The atmosphere above any given location is usually non-standard due to all three effects. The altimeter setting provided by the weather station only gives the aircrew an accurate altitude indication at *field elevation*; it is not necessarily accurate at other altitudes. We can, however, provide a more accurate altimeter setting for the release altitude by compensating for all the atmospheric effects that induce error.

The method we developed provides forecast altimeter settings for the weapon's release altitude. First, we rewrite Equation 1 to solve for sea- level pressure and substitute the U. S. Standard Atmosphere constants. The result is Equation 2.

$$p(0) = \frac{p(z)}{(1 - 6.875 * 10^{-6} ft^{-1} * z)^{5.2561}} \quad \text{Equation 2}$$

Next, we forecast a pressure level ($p(z)$) to be at height z and use Equation 2 to calculate the altimeter setting ($p(0)$) that places the pressure level at this altitude. It is easiest to do this for the sea level pressure and the standard pressure levels. Finally, we interpolate between the altimeter settings from the nearest two standard pressure levels to determine the altimeter setting for the release altitude. The D-Value chart does this graphically while a computer program solves the problem numerically.

In the past, we used the D-Value or altitude variation to describe (to aircrews) the deviation from the Standard Atmosphere. But the A-10 crews we worked with prefer the altimeter setting correction because it's easier to implement in flight planning.

HOW THE NEW LASTE 4 WORKS

As mentioned earlier, the 57th Test Wing is testing a new LASTE 4 version that uses instantaneous measurements of temperature and pressure at flight level to provide a corrected altitude. LASTE Version 4 uses a known altitude (MSL) as a reference level for calculating the aircraft's instantaneous altitude. LASTE determines aircraft altitude at the reference level by using either the field elevation in the BARO mode or the radar altimeter in DELTA mode. The computer stores the airfield elevation and pressure altitude at field elevation for the BARO reference level during the takeoff roll. In DELTA mode, the pilot picks a location with fairly flat terrain and a known elevation, then takes a radar altimeter measurement and stores the aircraft altitude (feet AGL) in the aircraft computer. LASTE 4 then adds the terrain elevation (MSL) to the aircraft's altitude above the terrain to calculate the reference level height (MSL).

When LASTE 4 measures the radar altitude or the reference level, it also measures the pressure altitude at the DELTA reference level and stores it in computer memory for altitude calculations. As the aircraft changes altitudes, LASTE

4 continues to measure pressure altitude and temperature. The computer determines the aircraft's altitude at any given moment by adding a corrected altitude change to either the field elevation (BARO mode) or the reference level height (DELTA mode), depending on the mode the pilot chooses to use.

The LASTE 4 altitude correction depends on the pressure altitude at the reference altitude, as well as on the instantaneous pressure altitude and temperature measurements. LASTE 4 first subtracts the pressure altitude at the reference level from the instantaneous pressure altitude measurement to determine the pressure altitude change (ΔPA). LASTE 4 multiplies the pressure altitude change by the ratio of the instantaneous temperature (T_{true}) to the standard atmosphere temperature (T_{std}) for the instantaneous pressure altitude. LASTE 4 then adds the corrected altitude change to the reference height to determine the instantaneous altitude. The LASTE 4 computer algorithm, then, becomes:

$$\text{Instantaneous\_Altitude} = \text{Reference\_Altitude} + \Delta PA \times \frac{T_{true}}{T_{std}} \qquad \text{Equation 3}$$

Consider the following example. On takeoff, the aircraft is at a field elevation of 2,000 feet MSL; pressure altitude is 2,100 feet. The aircraft climbs to a new altitude and takes a DELTA reference above a terrain elevation of 3,000 feet. If the radar altimeter reads 3,000 feet AGL, then the DELTA reference height is 6,000 feet MSL. Let's assume that the pressure altitude measured at the the DELTA reference level is 6,250 feet. Upon climbing to a new altitude, the LASTE measures a pressure altitude of 9,000 feet and a temperature of 283K. The standard atmosphere temperature at a pressure altitude of 9,000 feet is 270K (See Table 1). Therefore, the instantaneous altitude determined by the DELTA mode is:

$$\begin{aligned}\text{Instantaneous\_Altitude} = 6000' + (9000'\text{-}6250') \times \frac{283K}{270K} &= 6000' + 2000' \times 1.048 \qquad \text{Equation 4}\\ &= 6000' + 2882'\\ &= 8882'\end{aligned}$$

The BARO mode also continuously calculates an altitude. Table 2 shows the comparison of the BARO and DELTA calculations for the example described above. The altitude displayed in the Heads Up Display and used for ballistics calculations depends on the mode chosen by the pilot.

Table 2. Comparison of BARO and DELTA Altitude Calculations.

Mode	Reference Altitude	PA at Reference	PA at Altitude	Change in PA	Ttrue	Tstd	Temp Ratio	Instantaneous Altitude
BARO	2000	2100	9000	6900	283	270	1.048	9232'
DELTA	6000	6250	9000	2750	283	270	1.048	8882'

We need to understand the hypsometric equation and thickness calculations to understand the LASTE 4 algorithm. The hypsometric equation (Equation 5) states that change in height ("thickness", ΔZ) between one pressure level (p_0) and another pressure level (p) is proportional to the average virtual temperature ($T_{average}$) of the layer. R is the gas constant for dry air.

$$\Delta Z = R \times T_{average} \times \ln(\frac{p}{p_0}) \qquad \text{Equation 5}$$

In the standard atmosphere, the actual height of a pressure level equals the pressure altitude. Therefore, the thickness of a layer between two pressure levels in the standard atmosphere (Δz_{std}) equals the pressure altitude change (ΔPA). Also, the average virtual temperature ($T_{average}$) is the average of the standard atmosphere temperatures ($T_{average\_std}$) since the Standard Atmosphere assumes the atmosphere is dry. In this case, the temperature equals the virtual temperature. The LASTE calculation of the actual change in altitude becomes:

$$\Delta Z = \Delta PA \times \frac{T_{true}}{T_{std}} = \Delta Z_{std} \times \frac{T_{true}}{T_{std}} = R \times T_{average\_std} \times \ln(\frac{p}{p_0}) \times \frac{T_{true}}{T_{std}} \qquad \text{Equation 6}$$

The comparison of Equation 6 with Equation 5 shows that LASTE 4 approximates the average virtual temperature of the layer. LASTE multiplies the layer's average standard atmosphere temperature by the instantaneous temperature and divides the result by the standard atmosphere temperature for the instantaneous pressure altitude to determine the layer's average virtual temperature (Equation 7).

$$T_{average} = T_{average\_std} \times \frac{T_{true}}{T_{std}} \qquad \text{Equation 7}$$

LASTE 4 LIMITATIONS

The new software has some limitations that forecasters should know about. For example, Equation 7 represents an assumption made by the LASTE engineers about atmospheric temperatures that may not always be true. LASTE 4 can run into trouble under certain weather conditions, such as non-standard lapse rates. The hypsometric equation states that thickness depends on the mean virtual temperature of the layer. However, as shown in Equation 7, LASTE 4 uses one observed temperature reading to determine the layer average. Therefore, altitude errors may increase when the environmental lapse rate is non-linear or non-standard. Another possible problem lies in the fact that since LASTE 4 measures *temperature* (rather than virtual temperature), errors may increase in high humidity environments; these errors, however, should not exceed 1 or 2 percent. Finally, LASTE 4 errors may increase as the aircraft moves away from the reference location; the height of the reference pressure altitude may change in time and space.

Pilot should know that inversions reduce BARO mode accuracy. To decrease the effects of non-standard lapse rates, be sure to brief LASE 4 aircrews on *inversion heights*, since they'll want to take their reference measurements either above or below the inversion depending on the bombing altitude. Remind pilots that the trapped smog and dust below the top of the inversion layer provides a good visual clue to the inversion height for the DELTA reference altitude. Also brief the dissipation time of a surface radiation inversion.

Pilots should take the DELTA reference as close to the target as possible so as to reduce the error due to the change in height of the reference pressure level. If this is not possible, we developed a technique to decrease errors due to this effect.

LASTE 4 provides pilots the option to manually enter a DELTA value for a specified altitude. The 57 TG and the 57 OSS/OSW use this option to allow the pilot to manually enter a forecast DELTA value into the LASTE 4 computer to correct for the change in height of the reference level. Since the LASTE 4 DELTA value is the instantaneous pressure altitude minus the aircraft altitude, the DELTA value equals the negative of the D-Value for the DELTA reference altitude (MSL). Therefore, the process for providing the aircrew a forecast DELTA value is:

• The pilot provides the weather station with the target location, the time over target, and the desired altitude (MSL) for the DELTA value.

• The weather forecaster determines D-Values for the target location using a D-Value computation chart, computer program, or other method.

• The weather forecaster provides the pilot with the negative of the D-Value for the desired altitude. As an example, use the situation described in Figure 1; the desired DELTA altitude is 8,000 feet, The D-Value at 8,000 feet is +210 feet and the resulting DELTA value is -210.

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16 ASOS/ASW BLDG 5214 PILOT ST FT KNOX KY 40121-5540 1
17 ASOS ASW (C FLT) LAWSON AAF BLDG 2485 RM 110 FT BENNING GA 31905-6034 1
18 WEATHER SQ/CC PRAGER ST BLDG AT-3551 FT BRAGG AI NC 28307-5000 1
18 ASOG/WSO 259 MAYNARD STREET STE K POPE AFB NC 28308-2787 1
OL A 18 WEATHER SQ 6970 BRITTEN DRIVE STE 101 FT BELVOIR VA 22060-5132 1
OL B 18 WEATHER SQ CONDON RD BLDG 2408 FT EUSTIS VA 23604-5252 1
4 WXF 18 WS/FLIGHT CHIEF BLDG T-2205 GIVRY STREET FT DEVENS MA 01433-5310 1
19 ASOS/ASW 7163 HOTEL AVENUE FT CAMPBELL AI KY 42223-6114 1
20 ASOS/ASW (B FLT) BLDG 2065 RM 140 HANGAR ACCESS RD FT DRUM NY 13602-5042 1
20 OSS OSW 408 KILLIAN AVENUE SHAW AFB SC 29152-5047 1
21 ASOS/ASW POLK AAF BLDG 4226 FT POLK LA 71459-6250 1
23 OSS OSW 3393 SURVEYOR ST STE A POPE AFB NC 28308-2797 1
24 WS UNIT 0640 APO AA 34001-5000 1
27 OSS OSW 110 E SEXTANT AV STE 1040 CANNON AFB NM 88103-5322 1
28 OSS OSW 1820 VANDENBERG CT STE 3 ELLSWORTH AFB SD 57706-4729 1
49 OSS OSW 1801 8TH ST BLDG 571 HOLLOMAN AFB NM 88330-8023 1
51 CBCS/CTFW 575 10TH STREEET ROBINS AFB GA 31098-6345 1
55 OSS OSW 513 SAC BLVD STE 101 OFFUTT AFB NE 68113-2094 1
57 OSS OSW 6278 DEPOT RD STE 102 NELLIS AFB NV 89191-7256 1
65 OSS/WX UNIT 8025 APO AE 09720-8025 1
75TH RGR (ATTN: SWO) FT BENNING GA 31905-5000 1
93 OSS DOW 7TH ST BLDG 1340 RM 122 CASTLE AFB CA 95342-5000 1
96 CCSG SCTXD 201 WEST EGLIN STE 236 EGLIN AFB FL 32542-6829 1

NGB XOOSW MAIL STOP 18 ANDREWS AFB MD 20331-6008 1
104 WEATHER FLIGHT 2701 EASTERN BLVD BALTIMORE MD 21220-2899 1
105 WEATHER FLIGHT TNANG 240 KNAPP BOULEVARD NASHVILLE TN 37217-2538 1
107 WEATHER FLIGHT 26000 SOUTH ST BLDG 1516 SELFRIDGE ANGB MI 48045-5024 1
110 WEATHER FLIGHT HQ 131 TFW, 10800 NATURAL BRIDGE RD BRIDGETON MO 63044-2371 1
111 WEATHER FLIGHT 14657 SNEIDER STREET ELLINGTON ANGB TX 77034-5586 1
113 WEATHER FLIGHT 824 E VANATTI CIRCLE TERRE HAUTE IN 47830-5012 1
116 WEATHER FLIGHT 307 6TH STREET MCCHORD AFB WA 98439-1201 1
120 WEATHER FLIGHT 19089 BRECKENBRIDGE AVE AURORA CO 80011-9527 1
121 COS OTW BLDG 500 RICKENBACKER ANGB OH 43217-5005 1
121 WEATHER FLIGHT 3252 E PERIMETER ROAD ANDREWS AFB MD 20331-5011 1
122 WEATHER FLIGHT 400 RUSSELL AVENUE NEW ORLEANS NAS LA 70143-5200 1
123 WEATHER FLIGHT 6801 CORNFOOT ROAD PORTLAND OR 97218-2797 1
125 WEATHER FLIGHT 4200 N 93RD AVENUE TULSA OK 74115-1699 1
126 WEATHER FLIGHT 1919 EAST GRANGE AVE MILWAUKEE WI 53207-6298 1
127 WEATHER FLIGHT P.O. BOX 19061 FORBES ANGB TOPEKA KS 66619-5000 1
131 WEATHER FLIGHT 1 TANK DESTROYER BLVD BOX 35 BARNES ANGB MA 01085-1385 1
140 WEATHER FLIGHT (PAANG) 201 FAIRCHILD STREET WILLOW GROVE ARS PA 19090-5320 1
146 WEATHER FLIGHT 300 TANKER ROAD #4254 PITTSBURG IAP CORAOPOLIS PA 15108-4254 1
154 WEATHER FLIGHT CAMP ROBINSON NORTH LITTLE ROCK AR 72118-2200 1
156 WEATHER FLIGHT 5225 MORRIS FIELD DRIVE CHARLOTTE NC 28208-5797 1
159 WEATHER FLIGHT RT 1, BOX 465 CAMP BLANDING STARKE FL 32091-9703 1
164 WEATHER FLIGHT RICKENBACKER IAP 7556 SOUTH PERIMETER ROAD COLUMBUS OH 43217-5910 1
165 WEATHER FLIGHT 1019 OLD GRADE LANE LOUISVILLE KY 40213-2678 1
169 FG SW WEATHER STOP 6 MCENTIRE ANGB, 1325 SOUTH CAROLINA RD EASTOVER SC 29044-5006 1
181 WEATHER FLIGHT 8150 W JEFFERSON BLVD DALLAS TX 75211-9570 1
195 WEATHER FLIGHT 106 MULCAHEY DRIVE BLDG 106 PORT HUENEME CA 93041-4003 1
199 WEATHER FLIGHT 1102 WRIGHT AVENUE WHEELER AAF HI 96854-5200 1
200 WEATHER FLIGHT 5680 BEULAH RD. SANDSTON VA 23150-6109 1
202 WEATHER FLIGHT BLDG 3138 OTIS ANGB MA 02542-5001 1
203 WEATHER FLIGHT 125 PINEGROVE ST FT INDIANTOWN GAP ANNVILLE PA 17003-51AF 1
204 WEATHER FLIGHT 3305 FEIEBELKORN ROAD MCGUIRE AFB NJ 08641-6004 1
207 WEATHER FLIGHT 3912 W MINNESOTA ST INDIANAPOLIS IN 46241-4064 1
208 WEATHER FLIGHT 206 AIRPORT DR ST PAUL MN 55107-4098 1
209 WEATHER FLIGHT 2210 W 35 STREET, BLDG 9 RM 119 AUSTIN TX 78703-1222 1
210 WEATHER FLIGHT 1280 SOUTH TOWER DRIVE ONTARIO ANGB CA 91761-7627 1

301 OD/DOBW CARSWELL ARB TX 76127-5000 1
304 ARRS/DOOR PORTLAND IAP OR 97218-2797 1
314 OSS OSW 2740 1ST ST BLDG 120 LITTLE ROCK AFB AR 72099-5060 1
319 OSS/OSW 695 STEEN AVE STE 106 GRAND FORKS AFB ND 58205-6244 1
347 OSS OSW 8227 KNIGHTS WAY STE 1062 MOODY AFB GA 31699-1899 1
355 OSS OSWF 4360 S PHOENIX ST BLDG 4820 DAVIS MONTHAN AFB AZ 85707-4638 1
366 OSS OSW 665 THUNDERBOLT ST BLDG 262 RM 11 MT HOME AFB ID 83648-5401 1
410 OSS OSW 401 F AVE STE 7 K I SAWYER AFB MI 49843-4010 1
416 OSS OSW 592 HANGAR RD BLDG 1000 STE 121 GRIFFISS AFB NY 13441-4520 1
482 OG/OSAW 360 CORAL SEA BLVD HOMESTEAD AFS FL 33039-1299 1
509 OSS OSW 745 ARNOLD AVE STE 1A WHITEMAN AFB MO 65035-5026 1
DET 1 549 CTS/WX 661 7TH ST BICYCLE LAKE AAF BLDG 6212 FORT IRWIN CA 92310-5000 1
608 COS/DOOW 245 DAVIS AVE EAST BLDG 5546 STE 245 BARKSDALE AFB LA 71110-2279 1
758 AS/DOV 316 DEFENSE AVE STE 101 CORAOPOLIS PA 15108-4403 1
901 AG/OSA USAFR (KEN GOULD) 3976 KING GRAVES RD YOUNGSTOWN/WARREN MAP VIENNA OH 44473-0910 1

AETC/XOSW 1F ST STE 2 RANDOLPH AFB TX 78150-4325 1
AFIT LDEE 2950 P ST BLDG 640 WRIGHT-PATTERSON AFB OH 45433-7765 1
AFIT CIR WRIGHT-PATTERSON AFB OH 45433-6583 1
AU/ACSC (MAJOR MUOLO/DEA) 225 CHENNAULT CIRCLE MAXWELL AFB AL 36112-6426 1
12 OSS DOW H 08, 1350 5TH ST EAST RANDOLPH AFB TX 78150-4410 1
14 OSS DOW 595 1ST ST STE # 3 COLUMBUS AFB MS 39710-4201 1
42 OS/OSWF 220 WEST ASH BLDG 844 MAXWELL AFB AL 36112-6608 1
45 AS/OSFWX 817 H ST STE 102 KEESLER AFB MS 39534-2452 1
47 OSS DOW 541 1ST ST STE 2 LAUGHLIN AFB TX 78843-5210 1
56 OSS/OSW 14185 WEST FALCON LUKE AFB AZ 85309-1629 1
OL A 58 OSS OSW BLDG 324 GILA BEND AFAF AZ 85337-5000 1
64 OSS DOW 145 N DAVIS DR REESE AFB TX 79489-5000 1
71 OSS/OSW 301 GRITZ ST STE 52 VANCE AFB OK 73705-5412 1
80 OSS/DOAW 620 J AVENUE STE 3 SHEPPARD AFB TX 76311-2553 1
97 OSS WXF 603 E AVE STE 1 ALTUS AFB OK 73523-5033 1
325 OSS OSW STOP 22 408 FLIGHTINE RD2 TYNDALL AFB FL 32403-5124 1
333 TCHTS TTCJB 600 FIRST STREET STE 101 KEESLER AFB MS 39534-2494 1
334 TRS TTMV 700 H ST BLDG 4332 KEESLER AFB MS 39534-2499 1
558 FTS 2065 1ST DRIVE WEST RANDOLPH AFB TX 78150-4351 1

NAIC TATW 4115 HEBBLE CREEK ROAD STE 33 WRIGHT-PATTERSON AFB OH 45433-5637 1
AFCESA WE STOP 21 TYNDALL AFB FL 32403-6001 1
AFMC DOW 4225 LOGISTICS AVE STE 2 WRIGHT-PATTERSON AFB OH 45433-5714 1
AFOTEC/WE 8500 GIBSON BLVD SE KIRTLAND AFB NM 87117-5558 1
AL/OEBE ARMSTRONG LABORATORY 2402 EAST DRIVE BROOKS AFB TX 78235-5114 1
ASC/WE BLDG 91 3RD ST WRIGHT-PATTERSON AFB OH 45433-6503 1
ESC ENS 5 EGLIN ST HANSCOM AFB MA 01731-2116 1
ESC WE 5 EGLIN ST HANSCOM AFB MA 01731-2172 1

PL/GP 29 RANDOLPH ROAD HANSCOM AFB MA 01731-3010 1
PL/TSML 5 WRIGHT ST HANSCOM AFB MA 01731-3004 1
PL/GPOA (AFDIS POC) 29 RANDOLPH RD HANSCOM AFB MA 01731-3010 1
PL/LIAF 3550 ABERDEEN AVE SE KIRTLAND AFB NM 87117-5776 1
PL/LIMI 3550 ABERDEEN AVE SE KIRTLAND AFB NM 87117-5776 1
PL WE 3350 ABERDEEN AVENUE KIRTLAND AFB NM 87117-5776 1
RL/WE 525 BROOKS RD GRIFFISS AFB NY 13441-4505 1
SMC SDEW 160 SKYNET ST STE 2315 LOS ANGELES CA 90245-4683 1
WL/DOWM 2130 8TH ST STE 11 WRIGHT PATTERSON AFB OH 45433-7552 1

46 OSS/OSWA 601 W CHOCTAWHATCHEE AVE STE 60 EGLIN AFB FL 32542-5719 1
46 TW/TSWG 211 W EGLIN BLVD STE 128 EGLIN AFB FL 32542-5429 1
46 TEST GROUP WE 871 DEZONIA DRIVE BLDG 1183 HOLLOMAN AFB NM 88330-7715 1
72 OSS OSW 3800 A AVE BLDG 240 TINKER AFB OK 73145-9108 1
75 OSS/OSWT 5970 SOUTHGATE DR HILL AFB UT 84056-5232 1
76 OSS OSW 303 LUKE DR, STE 1 KELLY AFB TX 78241-5638 1
77 OSS/OSW 3028 PEACEKEEPER STE 4 MCCLELLAN AFB CA 95652-1020 1

78 OSS/OSW 200 EAGLE ST STE 202 ROBINS AFB GA 31098-2602 1
88 OSS/OSWA 2049 MONAHAN WAY BLDG 91 WRIGHT-PATTERSON AFB OH 45433-7204 1
88 OSS/OSWB 5291 SKEEL AVENUE STE 1 WRIGHT-PATTERSON AFB OH 45433-5231 1
412 OSS/WE 85 S FLIGHTLINE RD BLDG 1200 EDWARDS AFB CA 93524-6460 1
647 SVS/SVBMA (JASON SMITH) 98 BARKSDALE ST HANSCOM AFB MA 01731-1807 1
AFSOC DOOWO 100 BARTLEY ST HURLBURT FLD FL 32544-5273 1
16 OSS/OGSW 150 BENNETT AVE BLDG 90730 HURLBURT FIELD FL 32544-5727 1
193 SOG DOW BLDG 19-101 RM 108 ASF 1 INDIANTOWN GAP ANNVILLE PA 17003-5005 1

USSPACECOM J3W 250 S PETERSON BLVD STE 116 PETERSON AFB CO 80914-3220 1
AFSPACECOM/DOGW 150 VANDENBERG ST STE 1105 PETERSON AFB CO 80914-4200 1
30 WS/DOV 900 CORAL RD BLDG 21150 VANDENBERG AFB CA 93437-5001 1
ADF WE STOP 77 18201 E DEVILS THUMB AVE AURORA CO 80011-9536 1
AFSFC SYT 715 KEPLER AVE STE 60 FALCON AFB CO 80918-7160 1
CAPE CANAVERAL FORECAST FACILITY/ROCC BLDG 81900 CAPE CANAVERAL AFS FL 32925-6537 1
DET 2 SMC/TDOR (WEATHER) 1080 LOCKHEED WAY BOX 044 ONIZUKA AFB CA 94088-1235 1
21 OSS OGSW 125 W HAMILTON AVE PETERSON AFB CO 80914-1220 1
30 WS 900 CORRAL RD BLDG 21150 VANDENBERG AFB CA 93437-5002 1
30 WS/DOV 900 CORAL RD BLDG 21150 VANDENBERG AFB CA 93437-5001 1
45 WS/DOO 1201 MINUTEMAN ST PATRICK AFB FL 32925-3238 1
50 OSS WE 300 O'MALLEY AVE STE 26 FALCON AFB CO 80912-3026 1
90 OSS DOW 7505 SABER RD BLDG 1250 RM 1AF F E WARREN AFB WY 82005-2684 1
341 OSS DOW 7224 FLIGHTLINE DR ROOM 209 MALMSTROM AFB MT 59402-7526 1
SWC/DOB (STOP 8202) 720 IRWIN AVE FALCON AFB CO 80912-7210 1

AMC/DOWR 402 SCOTT DR UNIT 3A1 SCOTT AFB IL 62225-5302 1
AMC/XOWX 402 SCOTT DR UNIT 3A1 SCOTT AFB IL 62225-5302 1
AMWC/WCOXI 5656 TEXAS AVENUE FT DIX NJ 08640-5000 1
TACC/WXF 402 SCOTT DRIVE RM 132 SCOTT AFB IL 62225-5029 1
15 AF DOW MARCH AFB CA 92518-5000 1
22 OSS OSW 53435 KANSAS CT STE 110 MCCONNELL AFB KS 67221-3720 1
60 OSS/OSW 401 SECOND STREET TRAVIS AFB CA 94535-5030 1
62 OSS/OSW 1172 E STREET RM 127 MCCHORD AFB WA 98438-1008 1
89 OSS/OSW 1240 MENOHER DR BLDG 1220 ANDREWS AFB MD 20331-6511 1
92 OSS/OSW 901 WEST BONG STE 101 FAIRCHILD AFB WA 99011-8529 1
305 OSS/OSW 1730 VANDENBERG AVENUE MCGUIRE AFB NJ 08641-5509 1
375 OSS/OSW 433 HANGAR RD SCOTT AFB IL 62225-5029 1
377 ABW OTW 3400 CLARK AVE SE KIRTLAND AFB NM 87117-5776 1
380 OSS/OSW 301 ARIZONA AVE STE 1AF PLATTSBURGH AFB NY 12903-2705 1
434 OSS/ATWX BLDG S 28 HOOSIER BLVD GRISSOM ARB IN 46971-5000 1
436 OSS/OSW 501 EAGLE WAY ST DOVER AFB DE 19902-7504 1
437 OSS/OSW 101 S BATES ST STE A BLDG 169 CHARLESTON AFB SC 29404-5013 1
722 OSS/OSW 2645 GRAEBER ST STE 3 MARCH AFB CA 92518-2331 1

US ATLANTIC COMMAND 1562 MITSCHER AVENUE STE 200 NORFOLK VA 23551-2488 1
USAFALCENT RA POPE AFB NC 28308-5000 1
USCENTCOM CCJ3-W BLDG 540 MACDILL AFB FL 33608-7001 1
USCINCPAC (J37) BOX 13 CAMP H.M. SMITH HI 96861-5025 1
USEUCOM J3 OD WE UNIT 30400 BOX 1000 APO AE 09128-4209 1
USSOCCENT SCJ2- SWO 7115 S BOUNDARY DRIVE MACDILL AFB FL 33621-5101 1
USSOCOM SOJ3 OW 7701 TAMPA POINT BLVD MACDILL AFB FL 33621-5323 1
USSOUTHCOM SWO UNIT 0640 APO AA 34001-5000 1
USSTRATCOM J 315 901 SAC BLVD STE 1B29 OFFUTT AFB NE 68113-6300 1
USSTRATCOM/J3615 901 SAC BLVD STE 1F14 OFFUTT AFB NE 68113-6700 1
USTRANSCOM J3/4 OW 508 SCOTT DR BLDG 1900 SCOTT AFB IL 62225-5357 1
USTRANSCOM J5-SC (MITRE AFDIS) 508 SCOTT DR BLDG 1900 SCOTT AFB IL 62225-5357 1
OL A SOCOS/WX BLDG AT 3275 BAY 50 FT BRAGG NC 28307-5203 1

NCDC LIBRARY FEDERAL BUILDING ASHEVILLE NC 28801-2733 1
NGDC/NOAA (ATTN: AF LIAISON OFFICER) MAIL CODE E/GC2 325 BROADWAY BOULDER CO 80333-3328 1
NIST PUBS PRODUCTION RM A635 ADMIN BLDG GAITHERSBURG MD 20899 1
NOAA LIBRARY-EOC4W5C4 ATTN: ACQ 6009 EXECUTIVE BLVD ROCKVILLE MD 20852 1

NOAA/NWS W/OM21 SSMC-2 ROOM 13148 1325 EAST-WEST HIGHWAY SILVER SPRING MD 20910-3283 1
NOAA/MASC LIBRARY MC5 325 BROADWAY BOULDER CO 80303-3328 1
NOAA CENTRAL LIBRARY 1315 EAST-WEST HIGHWAY STE 2000 SILVER SPRING MD 20910 1
NOAA/NWS W/OSD SSMC- 2 ROOM 12220 1325 EAST-WEST HIGHWAY SILVER SPRING MD 20910-3283 1
NWS W/OM21 1325 EAST-WEST HWY RM 13208 SILVER SPRING MD 20910 1
NWS W/OSD BLDG SSM C-2 EAST-WEST HWY SILVER SPRING MD 20910 1
NWS TRAINING CENTER 617 HARDESTY KANSAS CITY MO 64124 1

DEFENSE INTELLIGENCE AGENCY DIA D1W 1B DIAC RM A4-130 WASHINGTON DC 20340-6612 1
DTIC-FDAC CAMERON STATION ALEXANDRIA VA 22304-6145 1
OFMC FEDERAL COORDINATOR FOR METEOROLOGY 8455 COLESVILLE ROAD STE 1500 SILVER SPRING MD 20910-5000 1

PACAF DOW 25 E ST STE I232 HICKAM AFB HI 96853-5426 1
3 ASOS/GEW BLDG 1558 FT WAINWRIGHT AIN AK 99703-5200 1
3 OSS WE 7TH ST BLDG 32235 ELMENDORF AFB AK 99506-3097 1
DET 1 3 ASOS/GEW BLDG 1558 FT WAINWRIGHT AK 99703-5200 1
8 OSS WX UNIT 2139 BLDG 2858 APO AP 96264-2139 1
15 OSS/OSW 800 HANGAR AVE HICKAM AFB HI 96853-5244 1
18 OSS/OSW UNIT 5177 BOX 40 APO AP 96368-5177 1
25 ASOS/DOW 1102 WRIGHT AVE WHEELER AAF HI 96854-5200 1
OL A 25 ASOS BRADSHAW AFB HI APO AP 96556-5000 1
35 OSS/OSW UNIT 5011 APO AP 96319-5011 1
36 OSS/OSW UNIT 14035 BOX AF APO AP 96543-4035 1
DET 1 36 OSS/OSJ PSC 489 BOX 20 FPO AP 96536-0051 1
51 OSS/DOW UNIT 2051 APO AP 96278-2072 1
374 OSS DOW UNIT 5222 APO AP 96328-5222 1
OL A 374 OSS APO AP 96343-0085 1

607 WEATHER SQUADRON/DO UNIT 15173 BLDG 1506 APO AP 96205-0108 2
607 COS/DOW UNIT 2072 APO AP 96278-2072 1
OL A 607 WEATHER SQUADRON UNIT 15630 BLDG 1610 APO AP 96208-0195 1
OL B 607 WEATHER SQUADRON UNIT 15242 BLDG S 252 UNIT 15242 APO AP 96205-0015 1
OL C 607 WEATHER SQUADRON UNIT 15676 BLDG S 3101 RM 4 APO AP 96297-0626 1
DET 1 607 WEATHER SQUADRON UNIT 15674 APO AP 96258-0674 1
OL A DET 1 607 WEATHER SQUADRON UNIT 15675 APO AP 96257-0675 1
OL B DET 1 607 WEATHER SQUADRON UNIT 15118 APO AP 06224-0420 1
DET 2 607 WEATHER SQUADRON UNIT 15200 BLDG S 819 APO AP 96271-0136 1
OL A DET 2 607 WEATHER SQUADRON UNIT 15673 APO AP 96218-0673 1

611 OSS/OSW 6900 9TH ST STE 205 ELMENDORF AFB AK 99506-2250 1
OL A DET 1 611 OSS/WE BLDG 47 432 RM 116 FT RICHARDSON AIN AK 99505-2250 1
354 OSS IM 1215 FLIGHT LINE AVE STE 2 EIELSON AFB AK 997026-1520 1

ARMED FORCES MEDICAL INTELLIGENCE CTR INFO SVCS DIV BLDG 1607 FT DETRICK FREDERICK MD 21702-5004 1
ARMY TRAINING AND DOCTRINE COMMAND ATDO-IW (ATTN: SWO) FT MONROE VA 23651-5000 1
ARMY RESEARCH LABORATORY BATTLEFIELD ENVIRONMENT DIR AMSRL-BE WHITE SANDS MISSILE RANGE NM 88002-5501 1
USASOC ATTN: AOIN-ST FT BRAGG NC 28307-5200 1
U.S. ARMY COMBAT SYS TEST ACTIVITY METEOROLOGY BRANCH, BLDG 1134 ATTN: STECS-PO-OM ABERDEEN PROVING GRND MD 21005-5059 1
COMMANDER US ARMY PACIFIC (APIN-OPW) FT SHAFTER HI 96858-5100 1
COMMANDER, FORCES COMMAND AFIN-ICW FT MCPHERSON GA 30330-6000 1
DIRECTOR USA-CETEC ATTN: GL-AE FT BELVOIR VA 22060-5546 1
DIRECTOR, USA REDSTONE TECHNICAL TEST CENTER ATTN: STERT-TE-F-MT REDSTONE ARSENAL AL 35898-8052 1
FIRST US ARMY ATTN STAFF WEATHER OFFICER FT MEADE MD 20755-7300 1
SECOND US ARMY AFKD-OPI-W (AFDIS POC) FT GILLEM GA 30050-5000 1
HQ DA DCS OPERATIONS AND PLANS ATTN: DAMO-ZD RM 3A538, 400 ARMY PENTAGON WASHINGTON DC 20330-5000 1
HQ 629TH MI BN (CEWI), 29TH ID (LIGHT) 7100 GREENBELT ROAD GREENBELT MD 20770-3398 1
FIFTH U.S. ARMY AFKB-OP (SWO) FT SAM HOUSTON TX 78234-7001 1
SIXTH US ARMY AFKC-OP-IS-SWO (AFDIS POC) PRESIDIO SAN FRANCISCO CA 94129-5000 1
HQ ARCENT AFRD-DSO-SWO FT MCPHERSON GA 30330-7000 1
LOS ALAMITOS AAF (MR ADAMS) BLDG 1 AFRC 11200 LEXINGTON DR LOS ALAMITOS CA 90720-5001 1

NATIONAL RANGE DIRECTORATE MET BRANCH ATTN: STEWS-NR-DA-F WHITE SANDS MISSILE RANGE NM 88002-5504 1

TECHNICAL LIBRARY DUGWAY PROVING GROUND DUGWAY UT 84022-5000 1
TEXCOM FSTD ATTN: CSTE-TFS-SP FT SILL OK 73503-6100 1
USA TECOM ATTN: AMSEL-TC-AM(BE) C O NVESD FT BELVOIR VA 22060-5677 1
USA INTELLIGENCE CTR (WEATHER SUPPORT TEAM) ATTN ATZS CDI-W FT HUACHUCA AI AZ 85613-6000 1
USA DUGWAY PROVING GROUND TROPICAL TEST SITE UNIT 7140 ATTN: STEDP-MT-TM-TP APO AA 34004-5000 1
USA TECOM ATTN: AMSEL-RD-NV-VMD (MET) FT BELVOIR VA 22060-5677 1
USA ARMY ENGINEER TOPOGRAPHIC LAB ATTN: CEETL-TD FT BELVOIR VA 22310-3864 1
USARSPACE (MOSC-OO) 1670 N NEWPORT RD STE 121 COLORADO SPRINGS CO 80916-2749 1
1CC AZSB-GTFD AH-64 CSM ATTACK FT CAMPBELL AI KY 42223-5000 1
160TH SOAR(A) ATTN: ADAV-ST-FS(MR LEVARN) 6950 38TH STREET FT CAMPBELL KY 42223-1291 1
OL A AFCOS FT RICHIE MD 21719-5010 1

AFESC/RDXT BLDG 1120 STOP 21 TYNDALL AFB FL 32403-5000 1
AFOSR/NL BOLLING AFB DC 20332-5000 1
AFRES/DOTSC 155 2ND ST ROBINS AFB GA 31098-1635 1
AFTAC/TMKS 1030 SOUTH HIGHWAY A1A PATRICK AFB FL 32925-3002 1
AFTAC/TNRE 1030 SOUTH HIGHWAY A1A PATRICK AFB FL 32925-3002 1
AFTAC/TNLW 1030 SOUTH HIGHWAY A1A PATRICK AFB FL 32925-3002 1
ANGRC/DOSW 3500 FETCHET AVENUE ANDREWS AFB MD 20331-5157 1
DET 3 DOWX 1900 WEST FLAMINGO STE 266 PO BOX 19070 LAS VEGAS NV 89119-5116 1

US COAST GUARD RES & DEV CTR (AFDIS POC) 1082 SHENNCOSSETT RD GROTON CT 06340-6096 1
BUREAU OF METEOROLOGY TRAINING CENTER GPO BOX 1289K MELBOURNE AUSTRALIA 3001 1

USAFA DFEG FAIRCHILD HALL USAF ACADEMY CO 80840-5701 1
USAFA DEPT OF ECONOMICS & GEOGRAPHY COLORADO SPRINGS CO 80840-5701 1
USAFA DFP 2354 FAIRCHILD DR STE 2A6 USAF ACADEMY CO 80840-5701 1
54 OSS/OSW AIR FIELD DR. BLDG 9206 USAF ACADEMY CO 80840-5000 1

HQ JTF-PP (LT STEADLRY/USN) APO AE 09784-5000 1
NATO IMS (OPS DIVISION) PSC 80 BOX 36 APO AE 09724-5000 1
NATO LMS/OPS STAFF METEOROLOGICAL OFFICER APO AE 09724 1
AFSOUTH (CMFWC CAPT STRAYER) PSC 813 BOX 136 FPO AE 09620-5000 1
HQ AFN (AF WEATHER) UNIT 25702 BOX 178 APO AE 09242-5000 1

HQ USAFE/X00W (AFDIS POC) UNIT 3050 BOX 15 APO AE 09094-5015 1
USAFE XOOWR UNIT 3050 BOX 15 BLDG 546 ROOM 306 APO AE 09094-5015 1
USAFE XOOW UNIT 3050 BOX 15 BLDG 546 ROOM 306 APO AE 09094-5015 1
USAFE/DOW UNIT 3050 BOX 15 BLDG 546 ROOM 306 APO AE 09094-5015 1
3 AF/DOW UNIT 4840 APO AE 09459-4840 1
5 ATAF WEA OFFICE (LTC CERASUOLO) 5 ATAF WEATHER CENTRE 36100 VINCENZA ITALY 1
10 OSS OSW UNIT 5605 BOX 175 APO AE 09470-5175 1
16 AF WE UNIT 6365 APO AE 09601-6365 1
17 AF/WE UNIT 4065 APO AE 09136-5000 1
31 OSS OSW UNIT 6170 BLDG 904 APO AE 09601-6170 1
39 OSS OSW UNIT 1075 BOX 275 APO AE 09824-0275 1
48 OSS DOM UNIT 5245 BOX 390 APO AE 09464-5390 1
52 OSS WEF UNIT 8870 BOX 270 APO AE 09126-0270 1
86 OSS DOWA/BASE WEATHER STATION UNIT 8495 APO AE 09094-8495 1
86 OSS/DOW UNIT 8495 APO AE 09094-8495 1
86 OSS/OSW UNIT 470 APO AE 09136-4070 1
86 OSS DOWB/WEATHER SUPPORT UNIT UNIT 8495 APO AE 09094-8495 1
100 OSS DOW UNIT 4965 BLDG 500 APO AE 09459-4965 1

617 WS UNIT 29351 BLDG 12 APO AE 09014-5000 4
A FLT 617 WS UNIT 29231 APO AE 09102-3737 1
DET 1 617 WS UNIT 30400 BOX 1000 APO AE 09128 1
DET 2 617 WS UNIT 20200 BLDG 1310 APO AE 09165-9816 1
DET 3 617 WS CMR 416 BOX S APO AE 09140-9998 1
DET 4 617 WS UNIT 7890 EUROPEAN FORECAST CENTER APO AE 09126-7890 1

DET 5 617 WS CMR 454 UNIT 31020 APO AE 09250-0047 1
DET 6 617 WS UNIT 29632 APO AE 09096-5000 1
DET 7 617 WS UNIT 28130 APO AE 09114-5000 1
DET 8 617 WS UNIT 25202 HQ V CORPS G2 SWO APO AE 09079-5000 1
DET 9 617 WS UNIT 28216 APO AE 09173-5000 1
DET 10 617 WS UNIT 26410 BLDG 543 RM 111 APO AE 09182-0006 1
OL A DET 8 617 WS UNIT 29719 BOX 363 APO AE 09028-3728 1
OL A 617 WS C/O 527 MI OPS APO AE 09157-5000 1
OL A DET 2 617 WS CMR 438 UNIT 5240 WEATHER OFFICE APO AE 09111-5000 1
OL B 617 WS CMR 423 APO AE 09107-5000 1
OL C 617 WS CMR 445 BOX 260 APO AE 09046-5000 2
OL D 617 WS C/O CMR 431 APO AE 09175-6321 1
OL E 617 WS UNIT 31401 BOX 6 APO AE 09630-0006 1

1610 ALSG(P) ATTN OIC WEATHER APO AE 09867-5000 1
4404 OSS/OSW ATTN AFDIS POC APO AE 09894-0408 1
4409 OG/WE (ATTN AFDIS POC) UNIT 66200 BOX 100 APO AE 09852-6200 1

COMNAVMETOCCOM CODE N312 STENNIS SPACE CTR MS 39529-5000 1
COMNAVMETOCCOM CODE N332 STENNIS SPACE CTR MS 39529-5001 1
COMNAVMETOCCOM/512 (LCDR FORD) 1020 BALCH BLVD STENNIS SPACE CENTER MS 39529-5005 1
COMNAVMETOCCOM (CODE N433) 1020 BALCH BLVD STENNIS SPACE CENTER MS 39529-5005 1
COMNAVSPECWARCOM (CODE N27 FORCE OCEANOGRAPHER) 2000 TRIDENT WAY SAN DIEGO CA 92155-5599 1
COMSECONDFLEET (CODE J335) FPO AE 09506-6000 1
COMSIXFLEET (CODE N312) CDR MCGEE FPO AE 09501-6002 1
FLENUMMETOCCEN ATTN: DAVE HUFF MONTEREY CA 93943-5005 1
FLENUMMETOCDET FEDERAL BUILDING ASHEVILLE NC 28801-2696 1
LIBRARIAN FLENUMMETOCEN MONTEREY CA 93943-5005 1
HQ USMC (CODE ASL-44/MAJOR BROWN) 2 NAVY ANNEX WASHINGTON DC 20380-1775 1
MARINE WING SUPPORT GROUP 27 (WO) PSC BOX 8082 CHERRY POINT MCAS NC 28532-8082 2
NAVAL RESEARCH LABORATORY MONTEREY CA 93943-5006 1
NAVAL RESEARCH LABORATORY CODE 4180 WASHINGTON DC 20375 1
NAVAL RESEARCH LABORATORY CODE 4323 WASHINGTON DC 20375 1
NAVAL POSTGRADUATE SCHOOL CODE MR/HY (ROBERT HANEY) 589 DYER RD BLDG 235 RM 2AF
MONTEREY CA 93943-5114 1
NAVAL POSTGRADUATE SCHOOL CHMN DEPT OF METEOROLOGY CODE 63 MONTEREY CA 93943-5000 1
NAVAL AIR WARFARE CENTER-WEAPONS DIVISION GEOPHYSICAL SCIENCES BRANCH CODE 32AF
POINT MUGU CA 93042-5001 1
COMMANDING OFFICER NAVEURMETOCCEN PSC 819 BOX 31 FPO AE 09645-3200 1
OFFICER IN CHARCE NAVEURMETOCDET PSC 817 BOX 13 FPO AE 09622-0800 1
OFFICER IN CHARGE NAVEURMETOCDET PSC 814 BOX 22 FPO AE 09865 1
OFFICER IN CHARGE NAVEURMETOCDET PSC 812 BOX 3380 FPO AE 09627-3380 1
NAVICECEN (LT KLEIN) 4251 SUITLAND RD FOB#4 WASHINGTON DC 20395 1
COMMANDING OFFICER NAVICECEN 4301 SUITLAND ROAD FOB #4 WASHINGTON DC 20395-5108 1
NAVLANTMETOCDET PATUXENT RIVER NAS MD 20670-5103 1
NAVLANTMETOCDET (AFDIS POC) PSC 1001 BOX 35-W FPO AE 09508-0014 1
NAVLANTMETOCEN 931 3 RD AVE MCCADY BLDG NORFOLK NAS VA 23511-2394 1
NAVLANTMETOCEN CODE 50, ATTN: MET TEAM 931 3RD AVE MCCADY BLDG NORFOLK NAS VA 23511-2394 1
NAVOCEANO CODE N2513 1002 BALCH BLVD STENNIS SPACE CTR MS 39522-5001 1
NAVOCEANO CODE 9220 STENNIS SPACE CTR MS 39529-5001 1
NAVOCEANO CODE N25131 8100 RM 203D STENNIS SPACE CTR MS 39522-5001 2
MAURY OCEANOGRAPHIC LIBRARY NAVOCEANO N4312 BLDG 1003 STENNIS SPACE CTR MS 39522-5001 1
NAVPACMETOCCEN ATTN: TECH LIBRARY BOX 113 PEARL HARBOR HI 96860-7000 1
NAVPACMETOCCEN WEST GUAM/JTWC PSC 489 BOX 2 FPO AP 96563-0051 1
NAVPACMETOCFAC NAS NORTH ISLAND SAN DIEGO CA 92135-5130 1
MOBILE ENVIRONMENTAL TEAM NAVPACMETOCFAC SAN DIEGO PO BOX 357076 NAS
NORTH ISLAND CA 92135-7076 1
NRAD (CODE 423/JIM BROYLES) 1045 MONTEREY VISTA WAY ENCINITAS CA 92024 2
OCEANOGRAPHER OF THE NAVY (AGCS KAEMPFER) US NAVAL OBSERVATORY BLDG 1 3450 MASS AVE
WASHINGTON DC 20392-5421 1
STATION OPERATIONS AND MAINTENACE SQDN ATTN METOC OFFICER (SGT DENATALE) MCAS YUMA AZ
85369-5020 . . . .

US PACIFIC FLEET (N3WX) CSC/WILLIAM LITTLE 250 MAKALAPA DRIVE PEARL HARBOR HI 96860-7000 1
WEATHER SERVICE-MCAS PO BOX 55010 BEAUFORT SC 29904-5001 2
WEATHER SERVICE USMC (WO SMITH) MCAS BOX 555151 CAMP PENDLETON CA 92055-5151 2
WSO H & HS MARINE STATION WEA MCAS TUSTIN CA 92710-5000 1
1 MARINE EXPEDITIONARY FORCE COMMAND ELEMENT (RLO) CAMP PENDLETON CA 92055-5300 1

AEDC TECHNICAL LIBRARY FL2804 100 KINDEL DR STE C212 ARNOLD AFB TN 37389-3212 1
HUMAN RESOURCES TECHNICAL LIBRARY FL2870 AL/HR-DOKL 7909 LINDBERG DR RM 239 BLDG 578
BROOKS AFB TX 78235-5352 1
AFFTC TECHNICAL LIBRARY FL2806 412 TW/TSTL 307 E POPSON AVE BLDG 1400 RM 106 EDWARDS AFB
CA 93524-6630 1
TECHNICAL LIBRARY FL2825 203 W EGLIN BLVD STE 300 EGLIN AFB FL 32542-6843 1
ROME LAB TECHNICAL LIBRARY FL2810 RL/SUL CORRIDOR W STE 262 26 ELECTRONIC PKWY BLDG 106
GRIFFISS AFB NY 13441-4514 1
ROME LAB RESEARCH LIBRARY FL2807 PL/TL (LIBRARY) 5 WRIGHT ST BLDG 1103 HANSCOM AFB MA 01731-3004 1
TECHNICAL LIBRARY FL2051 SA-ALC/CNL 485 QUENTIN ROOSEVELT RD BLDG 171 KELLY AFB TX 782416425 1
PHILIPS LAB TECHNICAL LIBRARY FL2809 PL/DOSUL 3400 ABERDEEN AVE SE BLDG 419 KIRTLAND AFB NM 87117-5776 1
AIR UNIVERSITY LIBRARY FL3386 AUL/LD 600 CHENNAULT CIRCLE BLDG 1405 MAXWELL AFB AL 36112-6424 1
AUL/LSE BLDG 1405 600 CHENNAULT CIRCLE MAXWELL AFB AL 36112-6424 1
TECHNICAL LIBRARY FL3100 HQ SSC/RMMI 201 E MOORE DR BLDG 856 RM 1701 MAXWELL AFB
GUNTER ANNEX AL 36114-3005. 1
TECHNICAL LIBRARY FL2513 45 SW CSR 5123 1030 S HWY A1A BLDG 989 RM A1-S3 BOX 4127 PATRICK AFB FL
32925-0127 1
TECHNICAL INFO CTR FL7050 AL/EQ-TIC 139 BARNES DR STE 2 BLDG 1120 TYNDALL AFB FL 32403-5323 1
TECHNICAL LIBRARY FL2827 30 SPW/XPOT 806 13TH ST STE A BLDG 7015 VANDENBERG AFB CA 93437-61111 1
WRIGHT LAB LIBRARY FL2802 WL/DOC 2690 C ST STE 4 BLDG 22 WRIGHT-PATTERSON AFB OH 45433-7411 1
TECHNICAL LIBRARY FL2830 NAIC/DXLS AREA A 415 HEBBLE CREEK RD STE 9 BLDG 856
WRIGHT-PATTERSON AFB OH 45433-6508 1
USAFA LIBRARY FL7000 HQ USAFA/DFSEL 2354 FAIRCHILD DR STE 3A10 USAF ACADEMY CO 80840-6214 1